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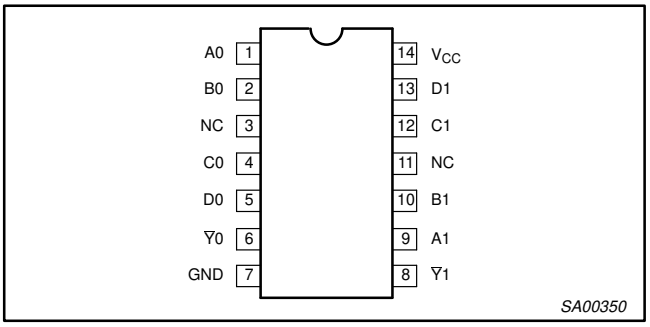
Dual 4-input NAND gate 74ABT20

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS T_{amb} = 25°C; GND = 0V	TYPICAL	UNIT
t_{PLH} t_{PHL}	Propagation delay An, Bn, Cn, Dn to $\overline{Y}n$	C_L = 50pF; V_{CC} = 5V	2.7 2.2	ns
t_{OSLH} t_{OSHL}	Output to Output skew		0.3	ns
C_{IN}	Input capacitance	V_I = 0V or V_{CC}	3	pF
I_{CC}	Total supply current	Outputs disabled; V_{CC} = 5.5V	50	µA

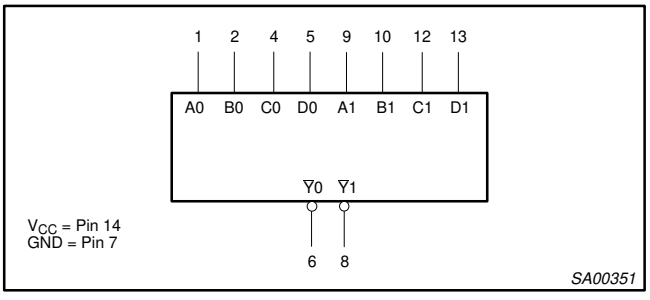
PIN CONFIGURATION



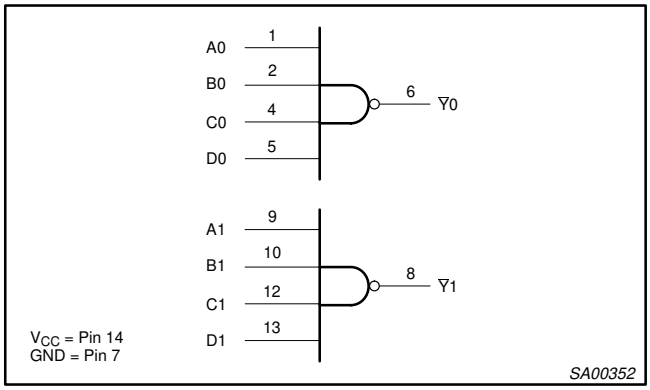
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 2, 4, 5, 9, 10, 12, 13	An, Bn, Cn, Dn	Data inputs
6, 8	$\overline{Y}$n	Data outputs
7	GND	Ground (0V)
14	V_{CC}	Positive supply voltage

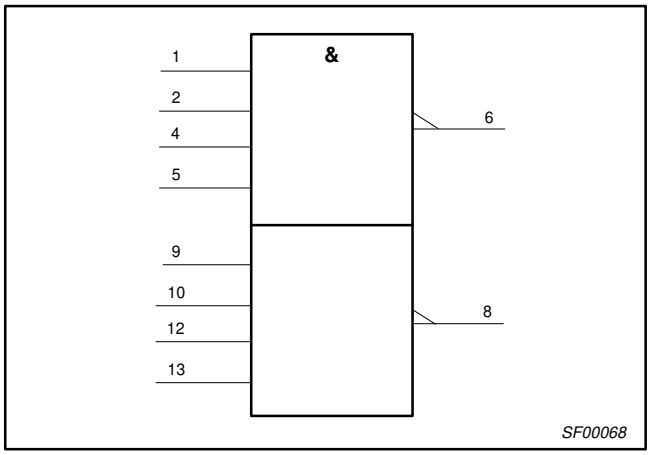
LOGIC SYMBOL



LOGIC DIAGRAM



LOGIC SYMBOL (IEEE/IEC)



FUNCTION TABLE

INPUTS				OUTPUT
An	Bn	Cn	Dn	$\overline{Y}$n
L	X	X	X	H
X	L	X	X	H
X	X	L	X	H
X	X	X	L	H
H	H	H	H	L

NOTES:
H = High voltage level
L = Low voltage level
X = Don't care

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
14-Pin Plastic DIP	–40°C to +85°C	74ABT20 N	74ABT20 N	SOT27-1
14-Pin plastic SO	–40°C to +85°C	74ABT20 D	74ABT20 D	SOT108-1
14-Pin Plastic SSOP Type II	–40°C to +85°C	74ABT20 DB	74ABT20 DB	SOT337-1
14-Pin Plastic TSSOP Type I	–40°C to +85°C	74ABT20 PW	74ABT20PW DH	SOT402-1

ABSOLUTE MAXIMUM RATINGS[1, 2]

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		–0.5 to +7.0	V
I_{IK}	DC input diode current	$V_I < 0$	–18	mA
V_I	DC input voltage[3]		–1.2 to +7.0	V
I_{OK}	DC output diode current	$V_O < 0$	–50	mA
V_{OUT}	DC output voltage[3]	output in Off or High state	–0.5 to +5.5	V
I_{OUT}	DC output current	output in Low state	40	mA
T_{stg}	Storage temperature range		–65 to 150	°C

NOTES:
1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		MIN	MAX	
V_{CC}	DC supply voltage	4.5	5.5	V
V_I	Input voltage	0	V_{CC}	V
V_{IH}	High-level input voltage	2.0		V
V_{IL}	Low-level input voltage		0.8	V
I_{OH}	High-level output current		–15	mA
I_{OL}	Low-level output current		20	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
T_{amb}	Operating free-air temperature range	–40	+85	°C

DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T_{amb} = +25°C			T_{amb} = –40°C to +85°C		
			MIN	TYP	MAX	MIN	MAX	
V_{IK}	Input clamp voltage	V_{CC} = 4.5V; I_{IK} = –18mA		–0.9	–1.2		–1.2	V
V_{OH}	High-level output voltage	V_{CC} = 4.5V; I_{OH} = –15mA; V_I = V_{IL} or V_{IH}	2.5	2.9		2.5		V
V_{OL}	Low-level output voltage	V_{CC} = 4.5V; I_{OL} = 20mA; V_I = V_{IL} or V_{IH}		0.35	0.5		0.5	V
I_I	Input leakage current	V_{CC} = 5.5V; V_I = GND or 5.5V		±0.01	±1.0		±1.0	µA
I_{OFF}	Power-off leakage current	V_{CC} = 0.0V; V_O or $V_I \leq$ 4.5V		±5.0	±100		±100	µA
I_{CEX}	Output High leakage current	V_{CC} = 5.5V; V_O = 5.5V; V_I = GND or V_{CC}		5.0	50		50	µA
I_O	Output current[1]	V_{CC} = 5.5V; V_O = 2.5V	–50	–75	–180	–50	–180	mA
I_{CC}	Quiescent supply current	V_{CC} = 5.5V; V_I = GND or V_{CC}		2	50		50	µA
ΔI_{CC}	Additional supply current per input pin[2]	V_{CC} = 5.5V; One data input at 3.4V, other inputs at V_{CC} or GND		0.25	500		500	µA

NOTES:
1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. For valid test results, data must not be loaded into the flip-flop or latch after applying the power.

AC CHARACTERISTICS

GND = 0V; $t_R = t_F$ = 2.5ns; C_L = 50pF, R_L = 500Ω

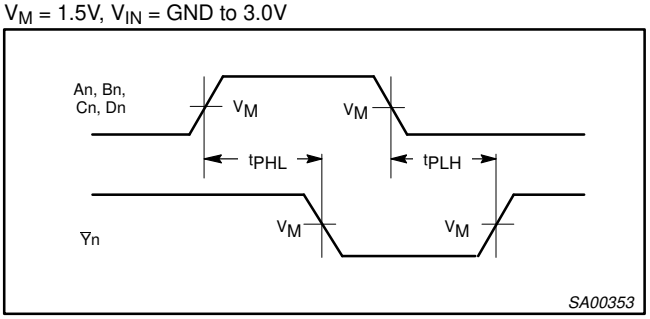
SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			T_{amb} = +25°C, V_{CC} = +5.0V			T_{amb} = –40°C to +85°C, V_{CC} = +5.0V ±0.5V		
			MIN	TYP	MAX	MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay An, Bn, Cn, Dn to $\overline{Y}$n	1	1.0 1.0	2.7 2.2	3.9 3.4	1.0 1.0	4.6 3.8	ns
t_{OSHL} t_{OSLH}[1]	Output to Output skew An or Bn to $\overline{Y}$n	2		0.3	0.5		0.5	ns

NOTE:

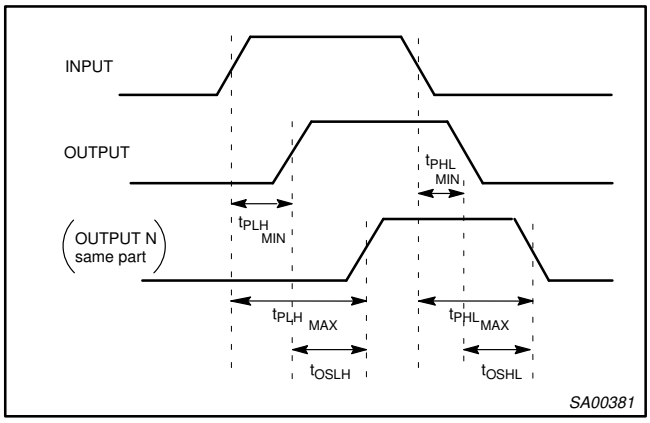
1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the the same direction, either HIGH–to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

AC WAVEFORMS

V_M = 1.5V, V_{IN} = GND to 3.0V

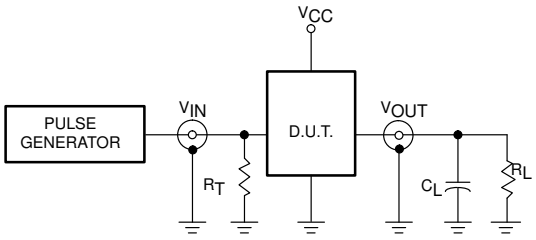


Waveform 1. Propagation Delay for Inverting Outputs

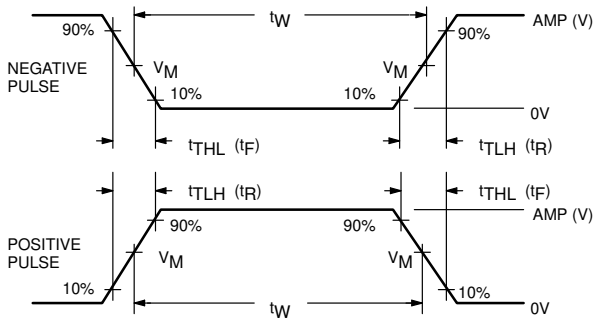


Waveform 2. Common edge skew

TEST CIRCUIT AND WAVEFORMS



Test Circuit for Outputs



V_M = 1.5V

Input Pulse Definition

DEFINITIONS

R_L = Load resistor; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	t_W	t_R	t_F
74ABT	3.0V	1MHz	500ns	2.5ns	2.5ns

SH00067